

AMENDMENTS TO THE CLAIMS

This listing of claims will replace all prior versions and listings of claims in the application:

LISTING OF CLAIMS:

Q1 1. (original) A method of controlling an ink jet recording apparatus on which a liquid container is able to be detachably mounted, said liquid container having a container body containing a liquid supplied to a recording head discharging an ink droplet from a nozzle opening and a piezoelectric device for detecting said liquid within said container body, comprising the steps of:

detecting a characteristic value of said piezoelectric device by a detection section provided inside or outside of said ink jet recording apparatus;

judging whether or not said characteristic value satisfies a predetermined condition by a judging section provided inside or outside of said ink jet recording apparatus; and

controlling said ink jet recording apparatus so that said ink jet recording apparatus is set in an operable state or in a non-operable state based on a result of said judging step.

2. (original) A method of controlling an ink jet recording apparatus according to claim 1, wherein said detecting step is executed at the time that said liquid container is mounted on said ink jet recording apparatus.

3. (original) A method of controlling an ink jet recording apparatus according to claim 1, further comprising a step of measuring a consumption volume of said liquid within said liquid container until at least a predetermined volume by a measuring section provided inside or outside of said ink jet recording apparatus.

Q1 4. (original) A method of controlling an ink jet recording apparatus according to claim 1, further comprising a step of, in a case that said ink jet recording apparatus is in said non-operable state, selecting either to maintain said non-operable state of said ink jet recording apparatus or to change said non-operable state of said ink jet recording apparatus to said operable state.

5. (original) A method of controlling an ink jet recording apparatus according to claim 1, wherein said characteristic value is an element characteristic value of a piezoelectric element of said piezoelectric device.

6. (original) A method of controlling an ink jet recording apparatus according to claim 1, wherein said characteristic value is an oscillation characteristic value of an oscillating portion of said piezoelectric device.

7. (original) A method of controlling an ink jet recording apparatus according to claim 1, wherein said liquid container is provided with at least two said piezoelectric devices,

wherein said detection section detects oscillation characteristic values of said at least two piezoelectric devices in said detecting step, and

wherein said judging section judges a consumption state of said liquid within said liquid container based on a relative condition of mutual oscillation characteristic values of said at least two piezoelectric devices in said judging step.

Q1 8. (original) An apparatus for controlling an ink jet recording apparatus on which a liquid container is able to be detachably mounted, said liquid container having a container body containing a liquid supplied to a recording head discharging an ink droplet from a nozzle opening and a piezoelectric device for detecting said liquid within said container body, comprising:

a detection section for detecting a characteristic value of said piezoelectric device, said detection section being provided inside or outside of said ink jet recording apparatus;

a judging section for judging whether or not said characteristic value satisfies a predetermined condition, said judging section being provided inside or outside of said ink jet recording apparatus; and

a controlling section for controlling said ink jet recording apparatus so that said ink jet recording apparatus is set in an operable state or in a non-operable state based on a result obtained by said judging section.

9. (original) An apparatus for controlling an ink jet recording apparatus according to claim 8, wherein said detection section detects oscillation characteristic values of at least two said piezoelectric devices which are attached to said liquid container, and

wherein said judging section judges a consumption state of said liquid within said liquid container based on a relative condition of mutual oscillation characteristic values of said at least two piezoelectric devices.

Q1 10. (original) A liquid container comprising:
a container body containing a liquid;
a liquid supplying opening for supplying said liquid outside of said container body; and
a piezoelectric device for detecting said liquid within said container body, said piezoelectric device being positioned nearby a liquid level of said liquid when said liquid is not consumed.

11. (original) A liquid container according to claim 10, further comprising an additional piezoelectric device for detecting said liquid within said container body.

12. (original) A liquid container according to claim 11, wherein said additional piezoelectric device is positioned nearby a bottom surface of said container body.

13. (original) A liquid container according to claim 11, wherein said additional piezoelectric device is positioned nearby said piezoelectric device, an initial liquid level when said liquid within said container body is not consumed being located between said piezoelectric device and said additional piezoelectric device.

14. (original) A liquid container according to claim 10, wherein said piezoelectric device and said additional piezoelectric device have oscillating sections contacting with a medium within said container body, respectively, and
wherein oscillation characteristic values of said oscillating sections are detected.

15. (original) A liquid container according to claim 10, wherein said liquid container is adapted to be mounted on an ink jet recording apparatus which performs a recording by a recording head discharging an ink droplet, said liquid within said container body being supplied to said recording head.

16. (original) An ink jet recording apparatus on which a liquid container is able to be detachably mounted, said liquid container having a container body containing a liquid and a piezoelectric device for detecting said liquid within said container body, comprising:

a recording head receiving said liquid from said liquid container and discharging an ink droplet from a nozzle opening; and

a controller for controlling an operation state of said ink jet recording apparatus, said controller including:

a detection section for detecting a characteristic value of said piezoelectric device, said detection section being provided inside or outside of said ink jet recording apparatus;

a judging section for judging whether or not said characteristic value satisfies a predetermined condition, said judging section being provided inside or outside of said ink jet recording apparatus; and

a controlling section for controlling said ink jet recording apparatus so that said ink jet recording apparatus is set in an operable state or in a non-operable state based on a result obtained by said judging section.

17. (original) An ink jet recording apparatus according to claim 16, further comprising a storage device capable of storing at least said characteristic value.

18. (original) An ink jet recording apparatus according to claim 16, further comprising a measuring section for measuring a liquid consuming volume within said liquid container until at least a predetermined volume.

19. (original) An ink jet recording apparatus according to claim 16, wherein said detection section detects oscillation characteristic values of at least two said piezoelectric devices which are attached to said liquid container, and

wherein said judging section judges a consumption state of said liquid within said liquid container based on a relative condition of mutual oscillation characteristic values of said at least two piezoelectric devices.

Q1 20. (original) A method of detecting a liquid consumption state of a liquid container mounted on an ink jet recording apparatus, said liquid container having a container body containing a liquid supplied to a recording head discharging an ink droplet from a nozzle opening and a piezoelectric device for detecting said liquid within said container body, comprising the steps of:

detecting oscillation characteristic values of at least two said piezoelectric devices attached to said liquid container by a detection section, said detection section being provided inside or outside of said ink jet recording apparatus; and

judging a consumption state of said liquid within said liquid container based on a relative condition of mutual oscillation characteristic values of said at least two piezoelectric devices by a judging section, said judging section being provided inside or outside of said ink jet recording apparatus.

21. (original) A method of detecting a liquid consumption state according to claim 20, wherein said relative condition of said oscillation characteristic values is that said oscillation characteristic values of said at least two piezoelectric devices are approximately equal to each other.

22. (original) An ink jet recording apparatus on which a liquid container is able to be detachably mounted, said liquid container having a container body containing a liquid and a piezoelectric device for detecting said liquid within said container body, comprising:

a recording head receiving said liquid from said liquid container and discharging an ink droplet from a nozzle opening; and

Q1 a controller for controlling an operation state of said ink jet recording apparatus, said controller including:

a detection section for detecting oscillation characteristic values of at least two said piezoelectric devices attached to said liquid container; and

a judging section for judging a consumption state of said liquid within said liquid container based on a relative condition of mutual oscillation characteristic values of said at least two piezoelectric devices.

23. (original) An ink jet recording apparatus according to claim 22, wherein said relative condition of said oscillation characteristic values is that said oscillation characteristic values of said at least two piezoelectric devices are approximately equal to each other.

24. (new) The apparatus for controlling an ink jet recording apparatus according to claim 8, wherein an oscillating section of said piezoelectric device is positioned just below an initial liquid level of said liquid.

Amendment under 37 C.F.R. § 1.111
U.S. Application No. 10/049,830

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25. (new) The apparatus for controlling an ink jet recording apparatus according to claim
8, wherein a vibrating region of said piezoelectric device extends from an initial liquid level of
said liquid, before said liquid is consumed, to a bottom surface of said liquid container.
